

CLAIMS

- 1.- A device for generating an oscillating signal, the device comprising
 - a means for providing a current of spin polarised charge carriers
 - a magnetic excitable layer adapted for receiving said current of spin polarised charge carriers thus generating an oscillating signal with a frequency ν_{osc} , and
 - an integrated means for interacting with said magnetic excitable layer to thereby select said oscillation frequency.
- 2.- A device according to claim 1, wherein said integrated means for interacting with said magnetic excitable layer is a means for controllable tunable interacting with said magnetic excitable layer such that a controllable tuning of said oscillation frequency is achieved.
- 3.- A device according to any of claims 1 to 2, wherein said interacting comprises performing magnetic interactions comprising inducing mechanical stress in said magnetic excitable layer.
- 4.- A device according to the previous claim, wherein said magnetic interactions are interface interactions.
- 5.- A device according to any of claims 1 to 4, wherein said interacting comprises performing any of magnetostatic interactions and exchange bias interactions.
- 6.- A device according to any of claims 1 to 5, wherein said magnetic excitable layer is a ferromagnetic semiconductor layer and said interacting comprises applying an electric field over said ferromagnetic semiconductor layer.
- 7.- A device according to any of claims 1 to 6, comprising a means for generating a magnetic bias field to bias the magnetic excitable layer.
- 8.- A device according to claim 7, wherein said means for generating a magnetic bias field is an anti ferromagnetic layer which is in at least partial magnetic contact with said magnetic excitable layer
- 9.- A device according to claim 8, comprising a means for generating stress upon said anti ferromagnetic layer.

- 10.- A device according to any of claims 7 to 9, wherein said means for generating said magnetic bias field comprises an element of ferromagnetic material which is magnetostatically coupled to said magnetic excitable layer.
- 5 11.- A device according to claim 10, further comprising a means for changing the geometric distances between said magnetic excitable layer and said ferromagnetic element.
- 12.- A device according to claim 11 wherein said means for changing the geometric distances consists of a piezoelectric layer or suspended
10 structure.
- 13.- A device according to any of claims 1 to 12, wherein said integrated means for interacting with said magnetic excitable layer comprises an interacting layer, which is coupled magneto-elastically and/or magneto-statically and/or via the exchange bias effect to said magnetic excitable
15 layer.
- 14.- A device according to claim 13, wherein said interacting layer is a piezoelectric layer.
- 15.- A device according to any of claims 13 to 14, wherein said interacting layer is an antiferromagnetic layer.
- 20 16.- A device according to any of claims 13 to 15, further comprising a surface acoustic wave generating means which can generate a Surface Acoustic Wave in said interacting layer.
- 17.- A device according to any of claims 13 to 16, wherein said interacting layer is a structural part of the Surface Acoustic Wave generating means.
- 25 18.- A device according to any of claims 16 to 17, wherein said Surface Acoustic Wave generating means generates a Surface Acoustic Wave in said interacting layer, which has a frequency essentially equal to the magnetic resonance frequency of said excitable layer, or an integer multiple thereof.
- 30 19.- A device according to any of claims 13 to 18, wherein at least 2 electrodes are provided on a surface or inside said interaction layer, which allow to induce stress in said interaction layer by putting an electrical potential difference over them.

- 20.- A device according to any of claims 13 to 19, comprising a means for generating stress in said interaction layer by physical force or pressure build up.
- 5 21.- A device according to any of claims 1 to 20, wherein said means for providing a current of spin polarised charge carriers is abutting on said magnetic excitable layer and comprises an electrode, a spin polarisation means and a current confinement structure.
- 10 22.- A device according to claim 21, wherein said means for providing a current of spin polarised charge carriers comprises a fixed layer with a constant magnetic polarisation through which the current is passing, before entering into the excitable layer.
- 23.- A device according to claim 22, wherein the fixed layer and excitable layer are separated by an interlayer to magnetic separate both layers.
- 15 24.- A device according to any of claims 1 to 23, further comprising a readout structure, which measures the excitation caused by the spin polarised current passing through said magnetic excitable layer or a related or equivalent parameter.
- 20 25.- A device according to any of claims 1 to 24, further comprising a readout structure, which measures the magneto-resistance or a related effect, generated by combination of the fixed layer and the magnetic excitable layer.
- 25 26.- A device according to any of claims 1 to 25, further comprising a readout structure, which comprises a piezoelectric measurement layer, which converts the precessional movement of the excitable layer into an electrical signal.
- 27.- A device according to any of claims 1 to 26, further comprising a readout structure, which measures the resistance change by measuring the AC signal between at least 2 electrodes in electrical contact with said excitable layer.
- 30 28.- A device according to any of claims 1 to 27, further comprising a readout structure, which measures the change of resistance or voltage in a lateral geometry.
- 29.- A method for generating oscillations, the method comprising

- providing a current of spin polarised charge carriers, thus generating an oscillating signal with an oscillation frequency ν_{osc} by interaction between said current of spin polarised charge carriers and a magnetic excitable layer, and
 - 5 - controllably tuning said oscillation frequency ν_{osc} by inducing an interaction between an integrated means and said magnetic excitable layer.
- 30.- A method according to claim 29, wherein inducing an interaction between an integrated means and said magnetic excitable layer comprises any of inducing mechanical stress in said magnetic excitable layer, inducing
- 10 exchange bias interactions and inducing magnetostatic interactions.
- 31.- A method according to any of claims 29 to 30, said magnetic excitable layer being a ferromagnetic semiconductor layer, wherein inducing an interaction is performed by applying an electric field over said ferromagnetic semiconductor layer.
- 15 32.- A method for reading out a magnetic element, the method comprising
- providing a current of spin polarised charge carriers, thus generating an oscillating signal with an oscillation frequency ν_{osc} by interaction between said current of spin polarised charge carriers and a magnetic excitable layer
 - 20 - controllably tuning said oscillation frequency ν_{osc} by inducing an interaction between an integrated means and said magnetic excitable layer, and
 - measuring an excitation, or a related or equivalent parameter, said excitation being caused by said spin polarised charge carriers